en **Operator's manual**

Machine for Industrial Applications

Document ID

ORIGINAL OPERATOR'S MANUAL

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Manufacturer: Liebherr-Hydraulikbagger GmbH
Type: LH 22 M Litronic
Type no.: 1250 (USA / CAN)
From Serial no.: 87688

Contact

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Engine type	Nominal power	High idle rpm	Code	97/68/EC stage	CO_2 emissions during NRSC testing or RMC testing under standard laboratory conditions	CO_2 emissions during NRTC testing with warm start under standard laboratory conditions
D924 A7-14 SCRT	129 kW	2200 rpm	F4HFE414G*B	IV	678.33 g/kWh	631.52 g/kWh
D934 A7-04	200 kW	1900 rpm	R04LQ7103	IV	682.18 g/kWh	726.85 g/kWh
D934 A7-14	140 kW	1900 rpm	R04LQ7102	IV	683.53 g/kWh	760.17 g/kWh
D934 A7-14	200 kW	1900 rpm	R04LU7101	IV	671.94 g/kWh	709.8 g/kWh
D936 A7-04	320 kW	1900 rpm	R06LQ7101	IV	650.74 g/kWh	694.6 g/kWh
D936 A7-14	320 kW	1900 rpm	R06LU7101	IV	664.06 g/kWh	673.06 g/kWh
D944 A7-04	200 kW	1900 rpm	R04KQ7102	IV	687.26 g/kWh	769.07 g/kWh
D944 A7-04	230 kW	1900 rpm	R04KQ7101	IV	682.36 g/kWh	750.86 g/kWh
D944 A7-14	200 kW	1900 rpm	R04KU7102	IV	686.43 g/kWh	731.46 g/kWh
D944 A7-14	230 kW	1900 rpm	R04KU7101	IV	681.03 g/kWh	713.34 g/kWh
D946 A7-04	330 kW	1900 rpm	R06KQ7102	IV	643.85 g/kWh	684.24 g/kWh
D946 A7-14	330 kW	1900 rpm	R06KU7101	IV	669.65 g/kWh	684.04 g/kWh
D9508 A7-04	455 kW	1900 rpm	V08MQ7102	IV	709.44 g/kWh	761.34 g/kWh
TCD 3.6 L4 DOConly / SCR	95 kW	2000 rpm	CFXI95BU	IV	713.39 g/kWh	730.75 g/kWh
TCD 3.6 L4 DOC-DPF / SCR	95 kW	2000 rpm	CFVI95BU	IV	691.21 g/kWh	705.07 g/kWh

Tab. 2: CO_2 emissions of diesel engine

Test conditions:
- NRSC / RMC: Stationary test cycle for mobile machines and equipment not intended for road traffic / ramped mode cycle. “Stationary test cycle” refers to a test cycle where the speed and the torque of the engine assume a limited number of nominally constant values; stationary tests are either single-phase test cycles or ramped mode cycles.
- NRTC: Non-stationary test for mobile machines and equipment not intended for road traffic. “Non-stationary test cycle” refers to a test cycle where the standardised speed and torque values change every second.

1.2.3 Sound level

The sound values of the machine are specified in the technical data.

The guaranteed sound power level (L_{WA}) is measured according to Directive 2000/14/EC.

The sound pressure level (L_{pA}) is measured according to ISO 6396. The measuring inaccuracy is defined in this standard.

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More Safety

Pipe Fracture Safety Valves
The standard pipe fracture safety valves on the stick and hoist cylinders prevent the attachments from dropping in an unregulated way and ensure maximum safety during every operation.

Working Range Limiters
For operations in which the working range should be limited, the material handling machines can be equipped optional with a working range limitation feature. Hereby all types of dimensions can be set: height, depth, width and proximity. Collisions and resulting component damage can thus be avoided.

Overload Warning Device and Load Torque Limitation
The acoustic and visual overload warning system continuously tells the operator about the current load situation of the machine. Furthermore, load torque limitation automatically regulates the speed of the working hydraulics to allow the maximum load bearing capacity to be approached safely. In the event of an overload, the functions which could cause the machine to topple are disabled. Only movements back to the safe working range are then possible.

High Machine Availability

Quality and Competence
Our experience, understanding of customer needs and the technical implementation of these findings guarantee the success of the product. For decades, Liebherr has been inspirational with its depth of production and system solutions. Key components such as the diesel engine, electronic components, slewing ring, swivelling drive and hydraulic cylinders are developed and produced by Liebherr itself. The great depth of in-house manufacturing guarantees maximum quality and ensures that components are optimally configured to each other.

Robust Design
All steel components are designed and manufactured by Liebherr itself. High-strength steel plates configured for the toughest of requirements result in high torsional stiffness and optimum absorption of forces induced for a longer service life.

Intelligent Self Diagnostics
The clever control electronics permanently monitor the vital functions of the machine to guarantee a high level of machine availability. Components which are critical for safety are designed with redundancy to guarantee maximum reliability.

QPDM – Quality and Process Data Management
- QPDM allows production data to be logged, documented and evaluated
- Automation of documentation and test specifications
- Ability to handle large quantities with maintain uniform high quality

Dust-intensive Jobs
- Large-dimension radiator with large mesh for optimum cooling performance, even in extremely dust-intensive conditions
- Protective grille with fine mesh, extending and folding fan for quick and easy cleaning
- Provision for the installation of filter systems on the cab

Recycling Package
- Reversible fan slows down the accumulation of dirt in the engine and radiator, guaranteeing high levels of machine availability
- Separate position of air conditioning compressor maximizes the air stream in the radiator/fan unit and guarantees good reliability even in extremely dust-intensive conditions
- Air pre-filter with dust discharge for extra-fine filtration of the engine intake air

Liebherr has now been developing and manufacturing material handling machines for a very wide range of applications in the scrap, port and timber handling sectors and for the waste and recycling industry for over 50 years. In the development of its machines, Liebherr chooses quality, durability and reliability from the very outset, together with performance and economy. Years of experience in design and construction are not only reflected in the end product but also in the components which are developed, designed and manufactured by Liebherr itself. This multiple sector expertise is used in product design from the early phase of the development process and thus allows high level technical innovations to be made.

2007

Opening of the assembly building for material handling machines

2013

Launch of the new LH series

2016

Launch of the new Port Material Handling Machines

Awarded the Bauma Design Prize for the LH 120

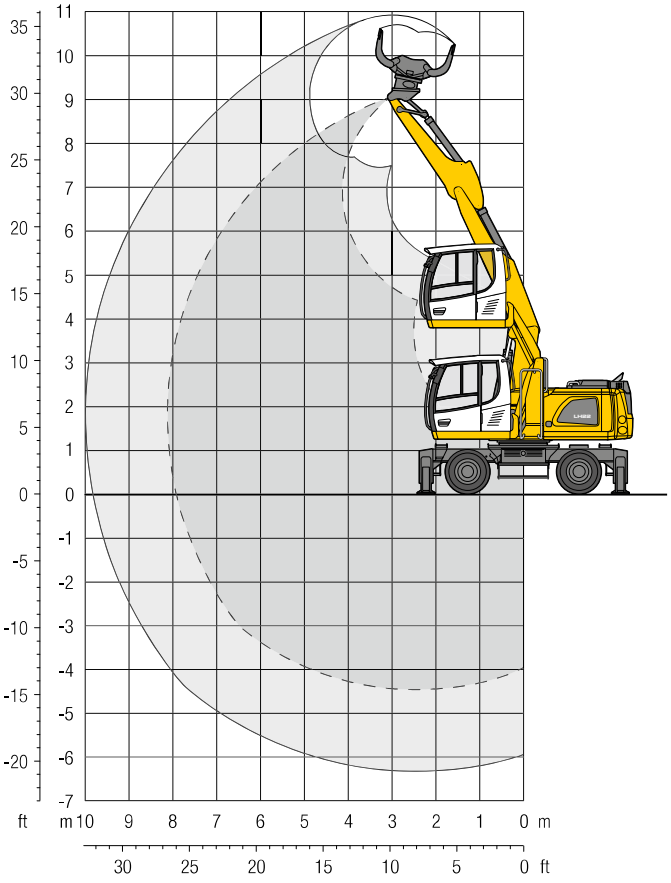
2010

Awarded the Bauma Innovation Prize for the ERC cylinder

Awarded the IF Award for the material handling machine LH 60

2014

LH 22 M – Attachment VK8

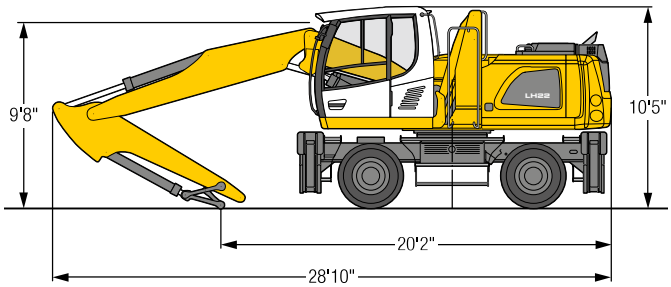


Operating Weight

The operating weight includes the basic machine with 4 point outriggers, hydr. cab elevation, 8 solid tires plus intermediate rings, two-piece boom 11'10", stick with tipping kinematics 8'8" and sorting grab SG 20B/0.65 yd³ perforated shells.

Weight	49,900 lb

Dimensions



ft	Undercarriage	10 ft		15 ft		20 ft		25 ft		30 ft				ft in
25	Stabilizers raised			11,1*	11,1*							6,5*	6,5*	18'
	4 pt. outriggers down			11,1*	11,1*							6,5*	6,5*	
20	Stabilizers raised			11,1*	11,1*	8,2	10,0*					5,6*	5,6*	22'5"
	4 pt. outriggers down			11,1*	11,1*	10,0*	10,0*					5,6*	5,6*	
15	Stabilizers raised	14,1*	14,1*	12,3	12,5*	8,3	10,4*					5,3*	5,3*	25'
	4 pt. outriggers down	14,1*	14,1*	12,5*	12,5*	10,4*	10,4*					5,3*	5,3*	
10	Stabilizers raised	20,6*	20,6*	12,0	14,7*	8,2	10,5	5,6	7,4			5,0	5,3*	26'4"
	4 pt. outriggers down	20,6*	20,6*	14,7*	14,7*	11,2*	11,2*	9,3*	9,3*			5,3*	5,3*	
5	Stabilizers raised	20,5	22,9*	11,8	15,2	8,1	10,4	5,4	7,3			4,8	5,5*	26'8"
	4 pt. outriggers down	22,9*	22,9*	16,4*	16,4*	11,9*	11,9*	9,4*	9,4*			5,5*	5,5*	
0	Stabilizers raised	20,7	25,8*	11,9	15,3	7,7	10,3	5,3	7,2			4,9	6,0*	26'
	4 pt. outriggers down	25,8*	25,8*	16,7*	16,7*	12,1*	12,1*	9,1*	9,1*			6,0*	6,0*	
– 5	Stabilizers raised	20,2	27,3*	11,4	15,6	7,3	9,9					5,4	7,1*	24'2"
	4 pt. outriggers down	27,3*	27,3*	17,0*	17,0*	12,3*	12,3*					7,1*	7,1*	
–10	Stabilizers raised	20,1	28,2*	10,8	15,0	7,1	8,6*					6,6	6,7*	21'
	4 pt. outriggers down	28,2*	28,2*	16,5*	16,5*	8,6*	8,6*					6,7*	6,7*	

Height **Can be slewed through 360°** **In longitudinal position of undercarriage** **Max. reach** *** Limited by hydr. capacity**

The lift capacities on the stick end without attachment are stated in lb x 1,000 and are valid on a firm, level supporting surface with blocked oscillating axle. These capacities can be slewed through 360° with the undercarriage in the transverse position. Capacities in the longitudinal position of the undercarriage (+/– 15°) are specified over the steering axle with the stabilizers raised and over the rigid axle with the stabilizers down. The values apply with the optimum positioning of the two-piece boom. Indicated loads based on the ISO 10567 standard and do not exceed 75 % of tipping or 87 % of hydraulic capacity. The lift capacity of the unit is limited by its stability, the lifting capability of the hydraulic elements, or the maximum permissible lifting capacity of the load hook.

Operator's Cab

	22 M	22 C
Stabilizer, control lever, left console	+	
Stabilizer, proportional control on left joystick	•	
Cab lights front, halogen	+	+
Cab lights front, halogen (under rain cover)	•	•
Cab lights front, LED	+	+
Cab lights front, LED (under rain cover)	+	+
Armrest adjustable	•	•
Slewing gear brake Comfort, button on the left or right joystick	+	+
Operator's seat Comfort	•	•
Operator's seat Premium	+	+
Driving alarm (acoustic signal is emitted during travel, can be switched ON / OFF)	+	+
Fire extinguisher	+	+
Footrest	+	+
Horn, button on left joystick	•	•
Joystick steering (max. 7.5 mph)	•	
Joystick and wheel steering (slim version)	+	
Cab elevation, hydraulic (LHC)	•	•
Cab elevation, rigid (LFC)	+	+
Automatic air conditioning	•	•
Wheel steering (slim version)	+	
LiDAT, vehicle fleet management	•	•
Proportional control	•	•
Radio Comfort, control via display with handsfree set	+	+
Preparation for radio installation	•	•
Back-up alarm (acoustic signal is emitted traveling backward, can not be switched off)	+	
Warning beacon on cab, LED	+	+
Windows made from impact-resistant laminated safety glass	+	+
Windscreen wiper, roof	+	+
Windshield wiper, entire windscreen	•	•
Top guard	+	+
Front guard, adjustable	+	+
Sun visor	+	+
Left control console, folding	•	•
Flashing light (xenon)	+	+

Attachment

	22 M	22 C
Boom lights, 2 pieces, halogen	•	•
Boom lights, 2 pieces, LED	+	+
Stick lights, 2 pieces, halogen	•	•
Stick lights, 2 pieces, LED	+	+
Filter system for working tool	+	+
Height limitation and stick shutoff, electronically	+	+
Boom cylinder cushioning	+	+
Stick camera (with separate monitor), bottom side, with protection	+	+
Liebherr multi coupling system	+	+
Liebherr quick coupler, hydraulic	+	+
Pipe fracture safety valves hoist cylinders	•	•
Pipe fracture safety valves stick cylinders	•	•
Quick coupling system LIKUFIX	+	+
Protection for piston rods, hoist cylinder	+	+
Overload warning device	+	+

Complete Machine

	22 M	22 C
Lubrication		
Lubrication undercarriage, manually – decentralized (grease points)	•	
Lubrication undercarriage, manually – centralized (one grease point)	+	
Central lubrication system for uppercarriage and attachment, automatically	•	•
Central lubrication system for undercarriage, automatically	+	
Central lubrication system, extension for tool attachment	+	+
Special coating		
Special coating, variants	+	+
Monitoring		
Rear view monitoring with camera	•	•
Side view monitoring with camera	•	•

• = Standard, + = Option
* = country-dependent

Options and / or special attachments, supplied by vendors other than Liebherr, are only to be installed with the knowledge and approval of Liebherr in order to retain warranty.

- Remove fuels, operating fluids and lubricants from all components before disposal.
- Collect and store fuels, operating fluids and lubricants in suitable containers before disposal.
- Adhere to instructions of relevant manufacturer when disposing of fuels, operating fluids and lubricants.
- Have fuels, operating fluids and lubricants disposed of by old oil recycling point.
- Have metal parts disposed of by metal recycling point.
- Have plastic parts disposed of by plastic recycling point.
- Have rubber parts disposed of by rubber recycling point.
- Have electronic components disposed of by electronics recycling point.

2.3 Description of staff

2.3.1 Personal protective equipment

Operators, assistants and maintenance staff are responsible for the following:
- Wearing personal protective equipment
- Regular cleaning and care of protective equipment
- Immediate replacement of damaged parts of protective equipment

The protective equipment consists of following elements:
- Protective helmet
- Safety glasses
- Hearing protection
- Breathing equipment
- Protective gloves
- Warning clothing (reflective, in signal colour)
- Safety boots
- Special protective clothing
  - To prevent burns
  - To prevent freezing
  - To prevent acid burns
  - To prevent stabbing and cutting injuries

2.3.2 Requirements for staff

Staff meet the following requirements:
- The machine is operated, maintained and repaired exclusively by authorised and trained persons.
- All persons operating, maintaining or repairing the machine have the required minimum age.
- Staff training involves theoretical information (technology and safety) and practical training on the machine.
- Staff have read and understood the operator's manual and supplied documentation.
- Experienced staff continuously supervise following staff.
  - Staff undergoing training
  - Staff undergoing education
  - Staff undergoing instruction
  - Staff undergoing a general apprenticeship
- Staff agree to work in safety-aware and risk-aware manner.

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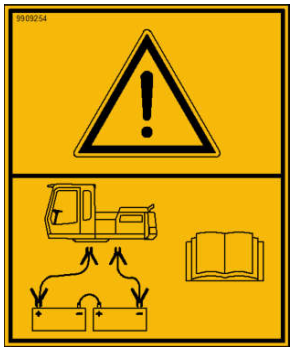
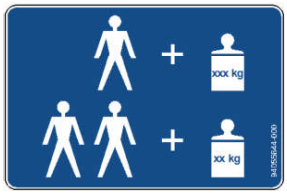
Sign	Description
	**Jump starting** Applies to machines with diesel engine. Before jump-starting machine, read instructions in the operator's manual.
 	**Load capacity** Indicate maximum load capacity value of height adjustable cab.
	**Closing upper windscreen** Applies to wheeled excavators. Indicates sequence for closing upper windscreen.
	**Speed 20 km/h** Applies to wheeled excavators. Indicates maximum permitted speed.

Tab. 6: Warning signs

2.4.2 Safety signs (USA)

Note

- ▶ Make sure that all warning signs are in place and are legible.
- ▶ Adhere to warning signs.

Exceeding of total weight

- Make sure that total weight of machine (see identification plate) is not exceeded.
- Make sure that the machine does not exceed the total weight with heavy working tools.
- Make sure that the machine does not exceed the total weight after changing the working attachment.
- Make sure that the machine does not exceed the total weight with add-ons or after retrofitting.

2.5.5 Roll over protective structure (ROPS)

Danger to life

Damaged falling object protective structures

- Do not put machine into service with damaged falling object protective structures.
- Do not put machine into service with deformed falling object protective structures.
- Do not use falling object protective structures with structural changes.
- Do not use repaired falling object protective structures.
- Do not perform welding on falling object protective structures.
- Do not cut or saw falling object protective structures.
- Do not drill falling object protective structures.

Exceeding of total weight

- Make sure that total weight of machine (see identification plate) is not exceeded.
- Make sure that the machine does not exceed the total weight with heavy working tools.
- Make sure that the machine does not exceed the total weight after changing the working attachment.
- Make sure that the machine does not exceed the total weight with add-ons or after retrofitting.

2.5.6 Falling object protective structures (FOPS and FGPS)

Danger to life

Damaged falling object protective structures

- Do not put machine into service with damaged falling object protective structures.
- Do not put machine into service with deformed falling object protective structures.
- Do not use falling object protective structures with structural changes.
- Do not use repaired falling object protective structures.
- Do not perform welding on falling object protective structures.
- Do not cut or saw falling object protective structures.
- Do not drill falling object protective structures.

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2.9 Safe maintenance

2.9.1 Spare parts

Danger to life

Incorrect spare parts

- Use original spare parts.
- Make sure that the spare parts meet the technical requirements specified by the manufacturer.
- After replacing parts, tighten loosened screw connections with prescribed tightening torque.
- Find prescribed tightening torque in supplied documentation.
- If the tightening torque is not prescribed by the supplied documentation: Find prescribed tightening torque in Liebherr factory standard.
- If the tightening torque is not prescribed by the Liebherr factory standard: Find tightening torque in valid DIN standard, EN standard or ISO standard.

2.9.2 Heavy parts

Danger to life

Incorrect handling

- Exclusively use machine for load-lifting with sufficient loading capacity.
- Exclusively use suitable and functioning lifting accessories with sufficient loading capacity.
- Make sure there are no persons underneath raised loads.
- Exclusively task qualified and experienced persons with the attaching of loads.
- Exclusively task qualified and experienced persons with the directing of operators.
- Make sure that the spotter can be seen by the operator.
- Make sure that spotter and operator are in voice contact if necessary.

Injury

Incorrect protective equipment

- Put on gloves when handling wire ropes.

2.9.3 Regular checks

Danger to life

Incorrect performance of checks

- Make sure that safety checks are performed regularly on the machine.
- Make sure that all checks are performed by suitable, competent and authorised persons.
- Adhere to national regulations.

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Symbol	Meaning
	Main movements of working attachment and slewing gear blocked
	Main movements of working attachment and slewing gear; neutral position required
	Hoist cylinder protection switched off
	Stick cylinder protection switched off
	Boom line break safety open
	Stick cylinder shut-off active
	Stick cylinder shut-off bypassed
	Stick cylinder shut-off for heavy working tool active
	Stick cylinder shut-off for heavy working tool bypassed
	Hoist cylinder shut-off active
	Hoist cylinder shut-off bypassed
	Height limitation bypassed, height limitation switched off
	Height limitation; upper shut-off point reached
	Depth limitation; lower shut-off point reached

LHB/12222151/01/2018-12-13/en

Rail guide system

Symbol	Meaning
	Rail guide system: Additional tyres blocked
	Automatic mode not active
	Neutral position required
	Rail guide system automatically blocked

Tab. 21: Status symbols of rail guide system

3.2.3 *Start page* menu

Menu call: 

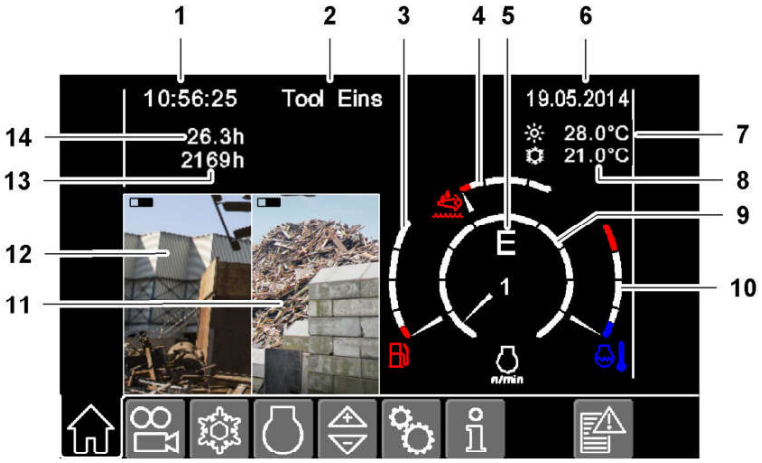

Fig. 244: Start page menu

1 Time
2 Selected working tool
3 Fill level in fuel tank
4 Fill level in diesel exhaust fluid tank
5 Operating mode
6 Date
7 Outside temperature
8 Selected cab temperature
9 Rev counter
10 Coolant temperature
11 Image of side area camera
12 Image of rear area camera
13 Total operating hours
14 Daily operating hours

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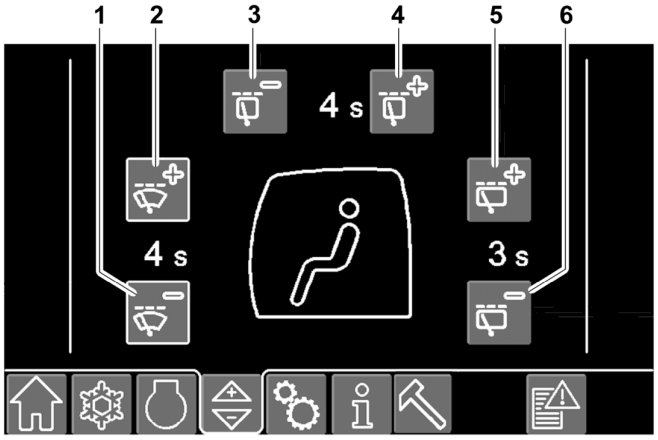

Fig. 274: Windscreen wiper interval submenu[4)]

1 *Reducing windscreen wiper interval* button
2 *Increasing windscreen wiper interval* button
3 *Reducing roof glass panel windscreen wiper interval* button
4 *Increasing roof glass panel windscreen wiper interval* button
5 *Increasing rear windscreen wiper interval* button
6 *Reducing rear windscreen wiper interval* button

3.2.12 *Radio remote control* submenu

Menu call: >

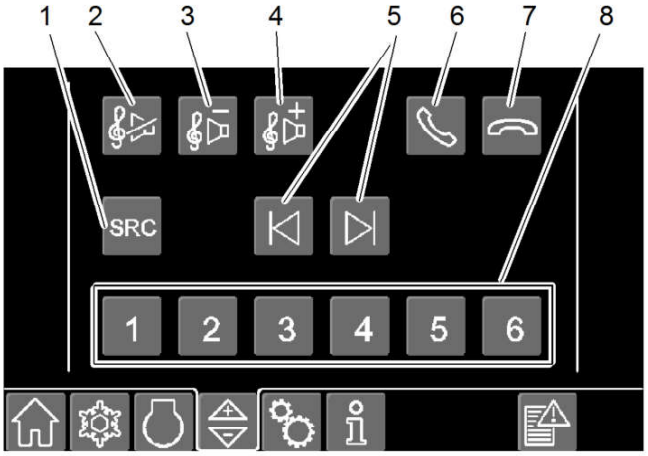

Fig. 275: Radio remote control submenu

1 *Selecting audio source* button
2 *Mute* button
3 *Volume down* button
4 *Volume up* button
5 *Changing radio station or track* buttons
6 *Answering phone call* button
7 *Ending phone call* button
8 *Selecting stored radio station* buttons

[4)] Quantity of windscreen wipers depending on machine type and equipment

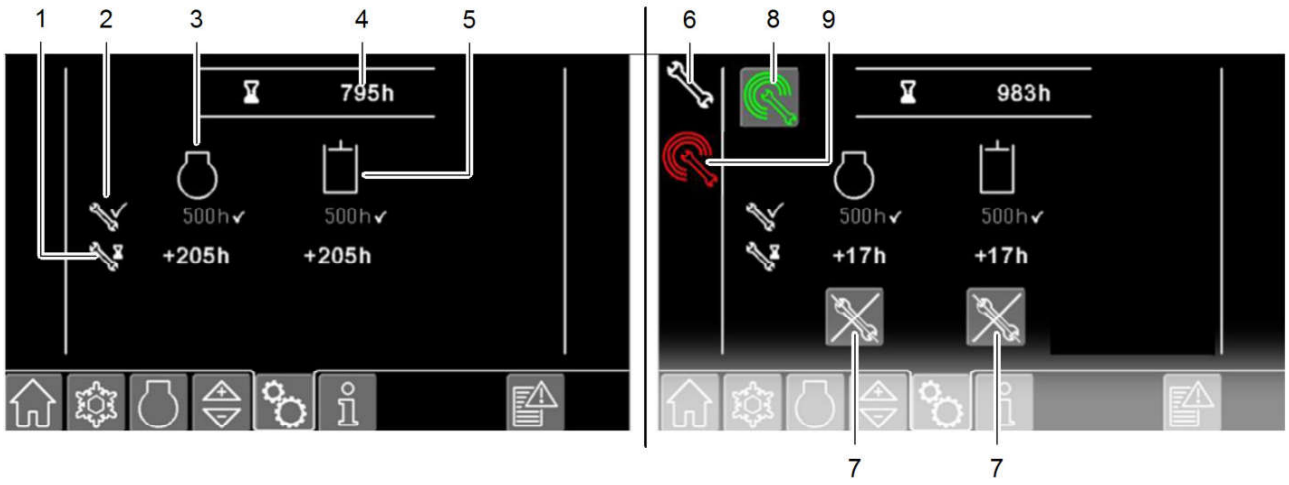

Fig. 314: Maintenance submenu

1	Remaining time to next maintenance	**4**	Total operating hours	**7**	*Confirmation of maintenance due message* button
2	Operating hour meter at last maintenance	**5**	Hydraulic system maintenance	**8**	*Teleservice* button
3	Maintenance of diesel engine	**6**	*Maintenance due* status symbol	**9**	*Teleservice activated* status symbol

Maintenance

If *maintenance due* status symbol **6** appears:

▶ Contact Liebherr customer service and have maintenance performed.

▶ Confirm display: Press *confirmation of maintenance due message* button **7**.
▷ *Maintenance due* status symbol **6** disappears.

Teleservice

Via Teleservice Liebherr customer service reads and modifies parameters of machine control online if necessary.

Activating write access

DANGER
Unexpected machine movement!
Danger to life.

▶ Make sure there are no persons in working area of machine.

Note
Malfunctions in machine control!

▶ Do not operate machine during write access by Liebherr customer service.

▶ Press *teleservice* button **8** when prompted by Liebherr customer service.
▷ *Teleservice* button **8** is displayed in green.
▷ *Teleservice activated* status symbol **9** appears.
▷ Online connection is enabled.
▷ Liebherr customer service has write access to machine control parameters.

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3.2.40 *Road travel position* submenu

Menu call:  > 

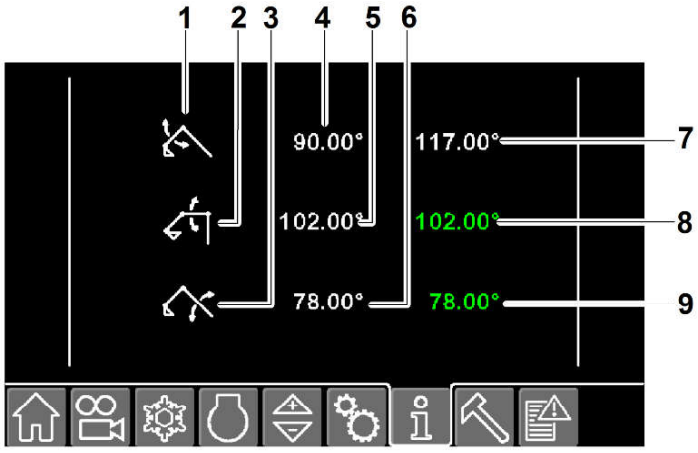

Fig. 346: Road travel position submenu

1 Positioning stick
2 Positioning boom
3 Positioning basic boom
4 Selected stick angle
5 Selected boom angle
6 Selected basic boom angle
7 Current stick angle
8 Current boom angle
9 Current basic boom angle

3.2.41 *Tool Control* menu

Menu call: 

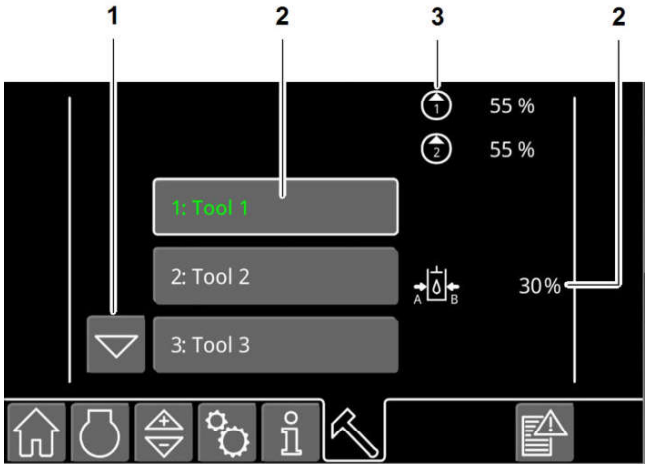

Fig. 347: Tool Control menu

1 *Scroll* buttons
2 *Working tool* button
3 Flow rate setting for working tool
4 Pressure setting for working tool

The *Tool Control* menu contains hydraulic settings for working tool:
– Flow rate setting for working tool
– Pressure setting for working tool

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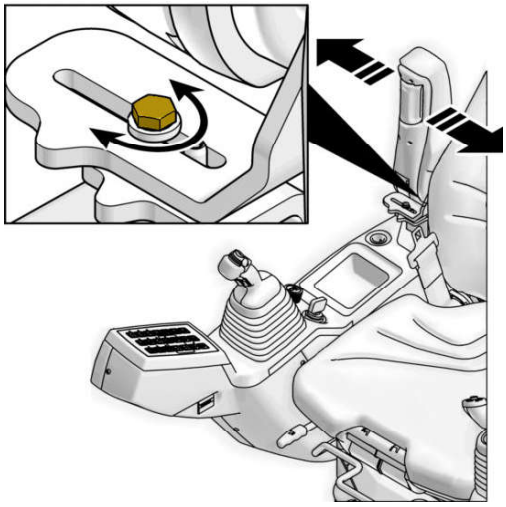


Fig. 367: Adjusting armrest laterally

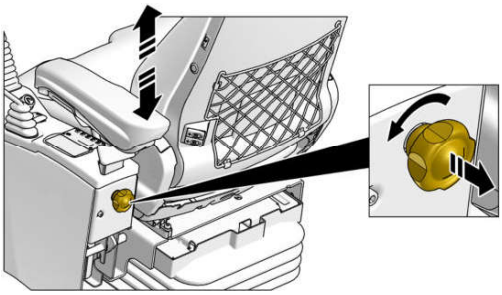


Fig. 368: Adjusting armrest height

▶ Make sure that armrest does not touch control unit of auxiliary heater.

Adjusting seat cushion

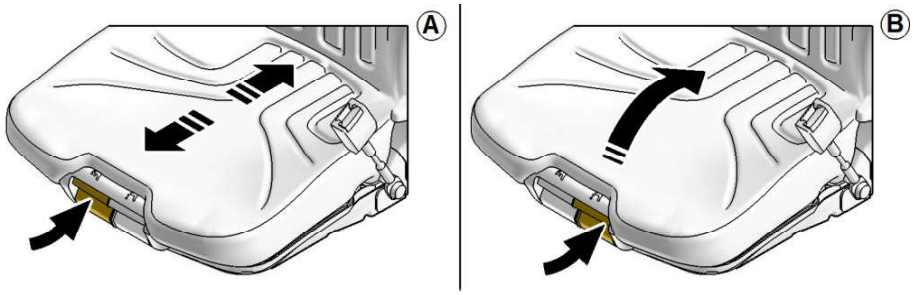


Fig. 369: Adjusting seat cushion

A Adjusting seat cushion depth

B Adjusting seat cushion angle

LHB/12222151/01/2018-12-13/en

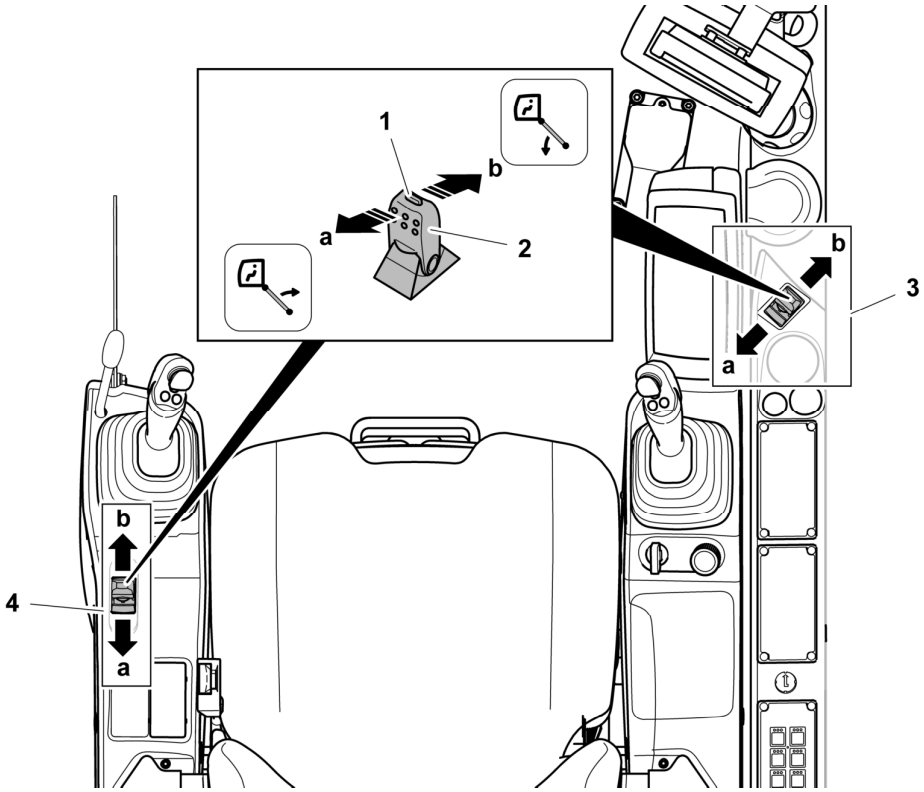


Fig. 397: Raising and lowering operator's cab

1	Unlocking button	**4**	Cab adjustment lever in left control console (control description sticker)
2	Cab adjustment lever	**a**	Raising operator's cab
3	Cab adjustment lever in right cab trim (control description sticker)	**b**	Lowering operator's cab

Raising operator's cab

- ▶ Press unlocking button **1**.
- ▶ Move cab adjustment lever **2** in direction **a**.

Lowering operator's cab

- ▶ Press unlocking button **1**.
- ▶ Move cab adjustment lever **2** in direction **b**.

Putting operator's cab in park position

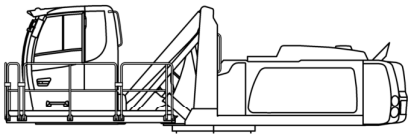


Fig. 398: Operator's cab in park position

- ▶ Press unlocking button.
- ▶ Move cab adjustment lever until operator's cab has reached park position.

LHB/12222151/01/2018-12-13/en

3.3.18 Lighting

Working attachment headlight

Key	Status of LEDs	Function
	○ ○ ○	Switched off
	○ ○ ✹	Boom headlight switched on
	✹ ✹ ✹	Boom headlight and stick headlight switched on
	○ ✹ ○	Stick headlight switched on

Tab. 33: Working attachment headlight

▶ Switch on and switch off working attachment headlight: Press *working attachment headlight* key.

Operator's cab headlight

Key	Status of LEDs	Function
	○ ○ ○	Front operator's cab headlight switched off
	✹ ✹ ✹	Front operator's cab headlight switched on
	○ ○ ○	Rear operator's cab headlight (option) switched off
	✹ ✹ ✹	Rear operator's cab headlight (option) switched on

Tab. 34: Operator's cab headlight

▶ Switch on and switch off front operator's cab headlight: Press *front operator's cab headlight* key.

▶ Switch on and switch off rear operator's cab headlight: Press *rear operator's cab headlight* key.

LHB/12222151/01/2018-12-13/en

Preheating hydraulic oil

▶ Put *hydraulic oil preheating* switch **6** into top position.
  ▷ *Hydraulic oil preheating* indicator light **5** lights up.
  ▷ Hydraulic oil preheating switches off at set temperature.

Preheating coolant

▶ Put *coolant preheating* switch **8** into top position.
  ▷ *Coolant preheating* indicator light **3** lights up.

Preheating engine oil

▶ Put *engine oil preheating* switch **7** into top position.
  ▷ *Engine oil preheating* indicator light **4** lights up.
  ▷ Engine oil preheating switches off at set temperature.

Ending preheating

▶ Put *hydraulic oil preheating* switch **6** into bottom position.

▶ Put *coolant preheating* switch **8** into bottom position.

▶ Put *engine oil preheating* switch **7** into bottom position.

▶ Unplug electric cable.

Checking electrical system

▶ Have an annual inspection of electrical system performed by electrician according to relevant national regulations.

3.4.6 Immobiliser (option)

The machine is supplied with two blue ignition keys and one red master key. Before starting, the machine's electrical system checks the ignition key for correct coding.

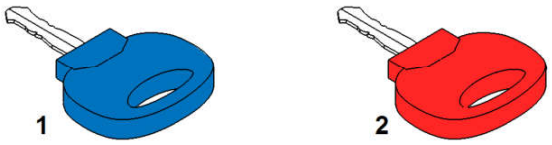


Fig. 452: Blue ignition key and red master key

1 Blue ignition key **2** Red master key

Note
The red master key is used exclusively to teach in or delete blue ignition keys.

▶ Keep red master key in safe place (for example with operator).

▶ Hand blue ignition keys to operator.

Teaching in ignition keys

A maximum of 10 ignition keys can be taught in.

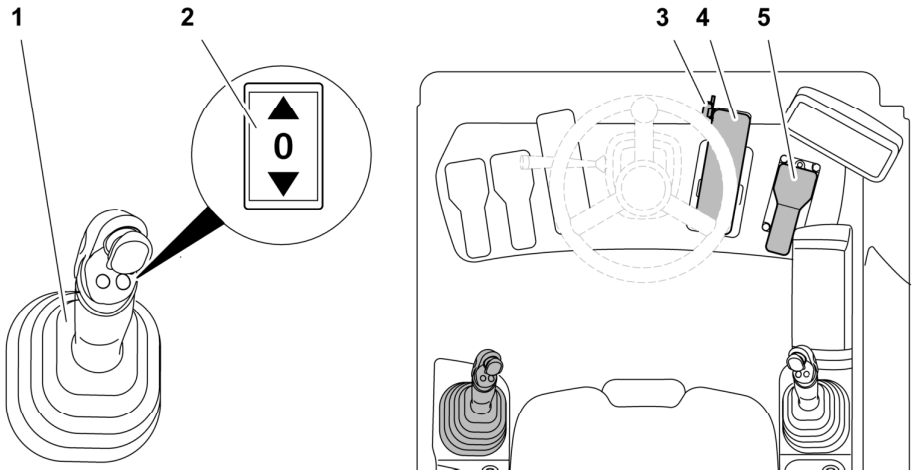
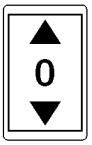


Fig. 486: Example position of control elements

1 Joystick
2 Travel direction switch
3 Retainer
4 Pedal of service brake
5 Accelerator pedal

Switch position		Symbol	Travel direction
	Top		Reverse
	0		Neutral
	Bottom		Forward

Tab. 43: Travel direction switch and status symbols

Note
Different machine configuration.

▶ Adhere to control description sticker in operator's cab.

If parking brake is applied:
▶ Press *parking brake* key.

If service brake is applied:
▶ Press retainer **3** downward.

▶ Select travel direction.

▶ Warn persons in the area: Sound horn.

▶ Press accelerator pedal **5** slowly.

(For more information see: 3.6.3 Travelling at operating location, page 211)

(For more information see: 3.6.4 Travelling with load at operating location, page 211)

(For more information see: 3.6.6 Travelling under obstacles, page 215)

3.4.24 Slewing brake

Key	Status of LEDs	Slewing brake
	LEDs light up ☀☀☀	Applied
	LEDs do not light up ○○○	Released
	Two LEDs flash ☀☀○	Slewing brake is applied as soon as uppercarriage is stationary.

Tab. 55: Status of slewing brake

Locking uppercarriage with slewing brake

Activating locking mechanism

NOTICE
Incorrect use!
Damage to slewing brake.

▶ Lock uppercarriage exclusively when stationary.

▶ Press *slewing brake* key.
▷ LEDs in *slewing brake* key light up.
▷ Uppercarriage is locked.

Deactivating locking mechanism

▶ Press *slewing brake* key.
▷ LEDs in *slewing brake* key go out.
▷ Uppercarriage can be turned.

LHB/12222151/01/2018-12-13/en

- ▶ Press *control changeover* key.
- ▶ Press confirmation button.
  - ▷ LEDs in key light up.
  - ▷ *Control changed over* status symbol appears on the display:

Controlling working tool

- ▶ Move right joystick **2** in direction **A** or **B**.

Controlling working tool with right mini-joystick

Changing over control

- ▶ Press *control changeover* key.
- ▶ Press confirmation button.
  - ▷ LEDs in key go out.

Controlling working tool

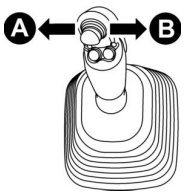


Fig. 565: Controlling working tool with mini-joystick

- ▶ Move right mini-joystick **1** in direction **A** or **B**.

3.4.32 Grapple priority (option)

For reduced grapple priority adhere to following points:
- Control limits hydraulic pressure of grapple.
- Closing force of grapple is reduced.
- Hydraulic system has sufficient oil flow for fast and smooth working attachment movements.

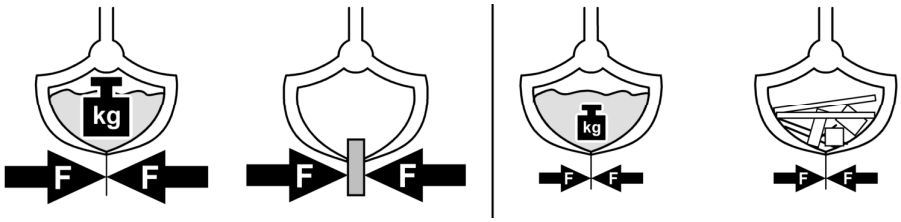


Fig. 566: Differently powerful closing forces for loads of different weights

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Key	Meaning
	Hoist cylinder shut-off is switched on
	It is possible to move the boom between the shut-off points.
	It is exclusively possible to set new shut-off points within the permitted working range.
	It is possible to bypass the shut-off points for 10 seconds.
	Hoist cylinder shut-off is switched off
	It is possible to set new shut-off points without restrictions.
	It is possible to move the boom without restrictions.
	Button is black. Teaching in shut-off point function is not available.

Tab. 60: Keys

Status symbol	Meaning
	Shortly before the shut-off point is reached, the speed of the boom movement is reduced automatically.
	When a shut-off point is reached, the boom movement stops.
	When a shut-off point is reached, it is exclusively possible to move the boom to the other shut-off point.
	Hoist cylinder shut-off is bypassed.
	It is possible to move the boom without restrictions.

Tab. 61: Status symbols

CAUTION
Unexpected settings!
Danger to life.

- ▶ Inform all operators of machine about changes.
- ▶ Set shut-off points again after every working tool change.

Switching on hoist cylinder shut-off

- ▶ Press *function settings* menu button.
- ▶ *Hoist cylinder shut-off* menu button.

- ▶ Press *hoist cylinder shut-off* button **1**.
  - ▷ *Confirmation required* status symbol appears on the display:

- ▶ Press confirmation button within 5 seconds.
  - ▷ *Hoist cylinder shut-off* button lights up green:

Teaching in maximum working height limit value

DANGER
High voltage!
Danger to life.

If an overhead power line restricts the height:
▶ Set maximum height limit value exclusively by hand.

Make sure the following preconditions are met:
❑ Supervisor supervises the setting of limit value.
❑ Settings for height limitation are enabled.
❑ Height limitation is switched on.
❑ Machine is in working position.
❑ Working tool operating mode is selected.

If new maximum working height is higher than previously set maximum working height:
▶ Bypass height limitation. (For more information see: Bypassing height limitation, page 205)

▶ Move working attachment up to limit value of maximum permitted working height.

▶ Press *maximum working height* button.

▶ Press confirmation button.
▷ Limit value of maximum working height value is saved.

Entering maximum working height limit value manually

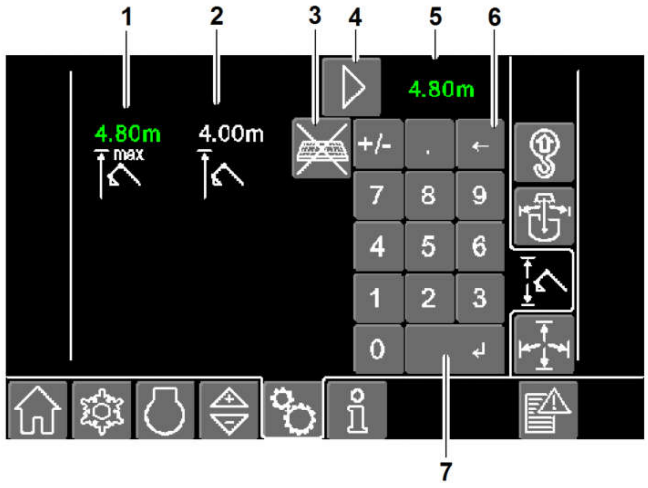


Fig. 651: Entering limit value manually menu

1	Limit value of maximum working height	**5**	Manually set limit value
2	Limit value of reduced working height	**6**	*Delete* button
3	*Hiding keyboard* button	**7**	*Accept* button
4	*Changeover* button		

Putting machine with travel gear in working position

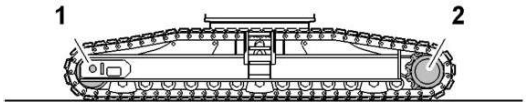


Fig. 667: Travel gear

1 Idler-wheel **2** Travel gearbox

▶ Perform work using idler-wheel.

3.6.3 Travelling at operating location

Basic travel position

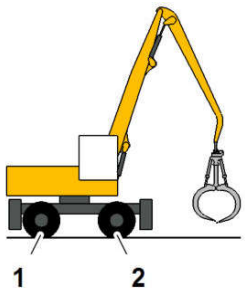


Fig. 668: Basic travel position

1 Rigid axle **2** Oscillating axle

▶ Empty working tool.

▶ Turn operator's cab over oscillating axle **2**.

▶ Move to basic travel position.

▶ Position working tool correctly: Make sure that working tool does not knock against machine during oscillating motions.

Travelling

Make sure the following preconditions are met:
- ❑ Driveway is clear.
- ❑ Travel without danger is possible.
- ❑ Basic travel position has been assumed.
- ❑ Oscillating axle is unlocked.
- ❑ Support is retracted.

▶ Warn persons in the area: Sound horn.

▶ Press accelerator pedal slowly.

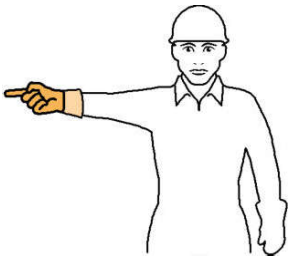
▶ Maintain basic travel position while travelling.

3.6.4 Travelling with load at operating location

Note

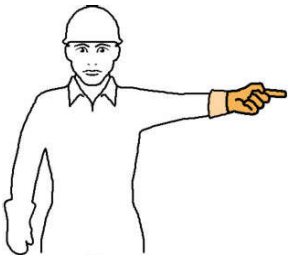
Liebherr recommends travelling without load.

Turning uppercarriage to the left

Hand gesture	Banksman	Machine
Extend arm sideways, in direction of rotation. Close fingers. Extend index finger.		

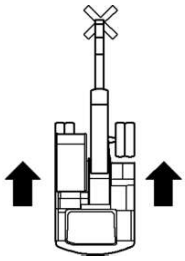
Tab. 72: Turning uppercarriage to the left

Turning uppercarriage to the right

Hand gesture	Banksman	Machine
Extend arm sideways, in direction of rotation. Close fingers. Extend index finger.		

Tab. 73: Turning uppercarriage to the right

Travelling forward

Hand gesture	Banksman	Machine
Rotate fists in front of body in direction of chain movement.		

Tab. 74: Travelling forward

LHB/12222151/01/2018-12-13/en

3.9.3 Tying down the machine

The operator's cab contains a sign with machine-specific tying specifications.

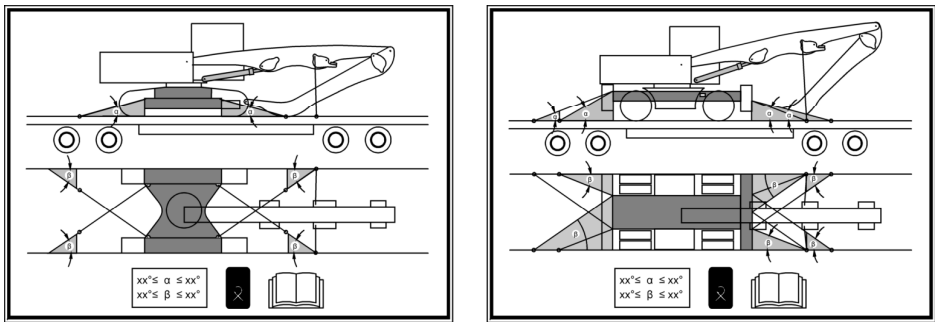


Fig. 714: Signs (example) in the operator's cab

DANGER
Machine slipping!
Danger to life.

- ▶ Secure machine adequately against slipping.
- ▶ Exclusively use suitable cables and chains.

- ▶ Tie machine with cables and chains at indicated points in line with machine-specific tying specifications.

LHB/12222151/01/2018-12-13/en

Symbol	Meaning	Effect, characteristic	Remedy
	Prewarning: Fuel pressure in Common Rail system is high or low.	Diesel engine is running unevenly. Diesel engine output is reduced automatically.	Shut off diesel engine. Have fuel filter cleaned by authorized specialist personnel or replaced if necessary; If symbol does not disappear: Contact Liebherr customer service.
	Fuel pressure in Common Rail system is too high or too low.		
	Prewarning: Fuel temperature is high.	Diesel engine output is reduced automatically. Diesel engine is damaged.	Shut off diesel engine. Clean fuel cooler. If symbol is still displayed: Contact Liebherr customer service.
	Fuel temperature is too high.		
	Prewarning: Coolant level is low.	Diesel engine is damaged.	Shut off diesel engine. Fill with coolant. If symbol is still displayed: Contact Liebherr customer service.
	Coolant level is too low.		
	Prewarning: Coolant temperature is high.	Diesel engine output is reduced automatically. Diesel engine is damaged.	Shut off diesel engine. Reduce load. Fill with coolant. Clean engine cooler. If symbol is still displayed: Contact Liebherr customer service.
	Coolant temperature is too high.		
	Prewarning: Air filter is contaminated. Dust collecting tank is full.	Diesel engine output is reduced automatically. Diesel engine is damaged.	Shut off diesel engine. Empty dust collecting tank. Replace air filter.
	Air filter is contaminated. Dust collecting tank is full.		
	Prewarning: Charge air temperature is high.	Diesel engine output is reduced automatically. Diesel engine is damaged.	Shut off diesel engine. Clean intercooling air circuit. If symbol is still displayed: Contact Liebherr customer service.
	Charge air temperature is too high.		
	Prewarning: Diesel engine speed is high.	Diesel engine is damaged.	Shut off diesel engine. Contact Liebherr customer service.
	Diesel engine speed is too high.		

LHB/12222151/01/2018-12-13/en

Malfunction / error	Cause	Remedy
Working attachment cannot be moved.	Limitation of working attachment has been initiated.	Bypass limitation. (For more information see: 3.5 Shut-off functions, page 187)
	Angle sensors of working attachment are defective.	Switch off limitation or shut-off (For more information see: 3.5 Shut-off functions, page 187) . Contact Liebherr customer service.
Working tool cannot be used.	Function is not switched on.	Switch on function.
	Hydraulic lines are not connected.	Connect hydraulic lines.

LHB/12222151/01/2018-12-13/en

Fuse	Consumer	Rating [A]
F2_1	K2_1, travel light left	10
F2_2	K2_2, beacon	10
F2_3	LiDAT, data interface option	5
F3_1	Reversing camera, side camera	10
F3_2	Not used	
F3_3	Door strap system, height adjustable cab	15
F4	Cigarette lighter	10
F5	Interior lighting triggered by door contact	5
F6	Interior lighting, mirror heater	5
F7	Option circuit board power supply	10
F8	Condenser fan	30
F9	K02, front roof light	30
F10	K07, rear window wiper	10
F11	K08, terminal 58	15
F12	K03, rear roof light	15 , 30
F14	Air-sprung operator's seat	10
F15	Terminal 15 air conditioning control	15
F16	Control unit A	15
F17	S7 safety lever or folding console	10
F18	Not used	15
F19	+24V input sensor for input modules FAP, A163, A164, A165	10
F20	Input logic for input modules FAP power supply	5
F21	Display, data interface J1939	5
F22	Terminal 15, master power supply	10
F23	A169, control unit	10
F24	A170, control unit	10
F25	A171, control unit, Tool Management	10
F26	A172, control unit	10
F27	Terminal 30, master power supply	10
F28	Not used	10
F29	Not used	10
F30	Starting switch	10
F31	Terminal 30 air conditioning control	20
F32	K05, roof wiper	10
F33	K04, windscreen wiper top	10
F34	K06, windscreen wiper bottom	10
F35	K09, Tool Management, voltage transformer, radio	15

Tab. 90: Main circuit board A161

LHB/12222151/01/2018-12-13/en

Customer:.....Machine type:.....Serial no.:.....Operating hours:.....Date:.....

Maintenance / inspection after service hours								Tasks to be performed		
On handover	All 8-10 h	All 50 h	All 500 h	All 1000 h	All 2000 h	Other intervals	Additional labelling	**By maintenance staff** ■ Once-only activity ● Repeat interval ✦ If necessary ❄ Annually before the winter **By authorised specialist staff** ☐ Once-only activity ❍ Repeat interval ✧ If necessary **Additional labelling** Assistance required Have this task carried out exclusively by a certified electrician	Confirm tasks	See page
☐		●	❍	❍	❍			Pipes, hoses and lubricating points: Check tightness and condition.		330
Slewing gearbox and slewing ring										
				❍	❍			Slewing gear: Check mounting.		
☐		●	❍	❍	❍			Slewing gearbox: Check oil level.		331
				❍	❍			Slewing gearbox: Take oil sample for oil analysis. .		
			☐	❍	❍			Slewing gearbox: Change oil.		
				❍	❍			Slewing gear brake: Check function.		

LHB/12222151/01/2018-12-13/en

5.3.7 Axle oils

Note
Machine with Kessler axles LT-D!

▶ Use gear oil Liebherr Gear Basic 90 LS or gear oils in line with specification API GL-5 and MIL-L_2105 D.

Liebherr recommendation

Ambient temperature	Description
-22 to 122 °F	Liebherr Gear Basic 90 LS
-31 to 122 °F	Liebherr Gear Plus 20W-40
-31 to 122 °F	Liebherr Gear MF80W

Tab. 118: Liebherr recommendation

Minimum quality requirements

Specification
API: GL-5
MIL-L: 2105 D
ZF: TE-ML 05C, 05D

Tab. 119: Minimum quality requirements

If axle oils from other manufacturers are used, information on change intervals must be obtained from respective manufacturer or supplier.

5.3.8 Gear oils

Gear oils specified in the table are not suitable for following gearboxes:
– Transmission (For more information see: 5.3.9 Transmission oils, page 282)
– Pump distributor gear
– Automatic transmission

Liebherr recommendation

Ambient temperature	Description
-22 to 122 °F	Liebherr Gear Basic 90 LS
-31 to 122 °F	Liebherr Gear Plus 20W-40
-22 to 122 °F	Liebherr Gear Hypoid 90 EP
-13 to 122 °F	Liebherr Hypoid 85W-140 EP
-40 to 122 °F	Liebherr Syntogear Plus 75W-90

Tab. 120: Liebherr recommendation

LHB/12222151/01/2018-12-13/en

5.6.4 Cleaning the fan and radiator

NOTICE
Hot and moving parts!
Risk of injury and burns.

- ▶ Shut off the diesel engine.
- ▶ Make sure that all parts have stopped moving before starting work.
- ▶ Make sure the diesel engine has cooled down before starting work.

- ▶ Pressure clean the radiator fins and fan impeller. Blow from the inside of the machine to the outside.

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– Warning symbols

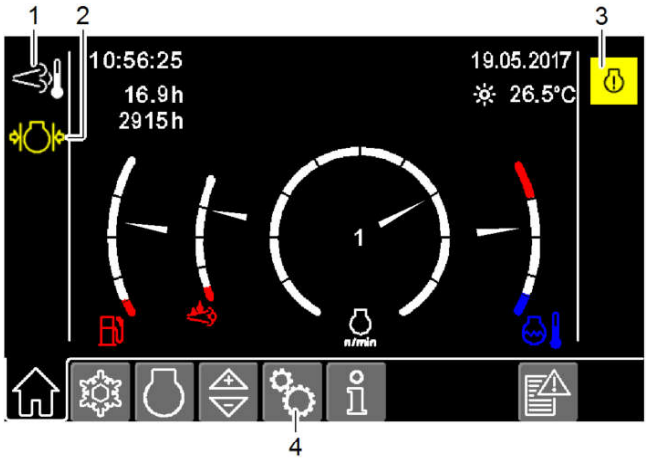

Fig. 819: Start page menu

1 *Filter regeneration in progress* status symbol
2 *Diesel engine power reduction* status symbol
3 *Prewarning: Control error of diesel engine* warning symbol
4 *Function settings* menu

Contamination level of diesel particulate filter

NOTICE
Contaminated diesel particulate filter!
Damage to diesel engine.

▶ Shut off diesel engine.

▶ Have diesel particulate filter checked by Liebherr customer service.

The contamination level of the diesel particulate filter is divided into three levels. Status symbols indicate the contamination level of the diesel particulate filter.

Level	Contamination	Status symbol
0	Normal	-
1	High	
2	Maximum	 and 

Tab. 129

5.10 Working hydraulics

5.10.1 Depressurising hydraulic system

Depressurising hydraulic hoses

Make sure the following preconditions are met:
❑ Ignition key is in position 1.

▶ Lower working attachment to the ground.

▶ Shut off diesel engine or electric motor immediately.

▶ Move folding console downwards.

▶ Operate joysticks and pedals carefully in all directions.
▷ Hydraulic lines are depressurised.

Depressurising hydraulic tank

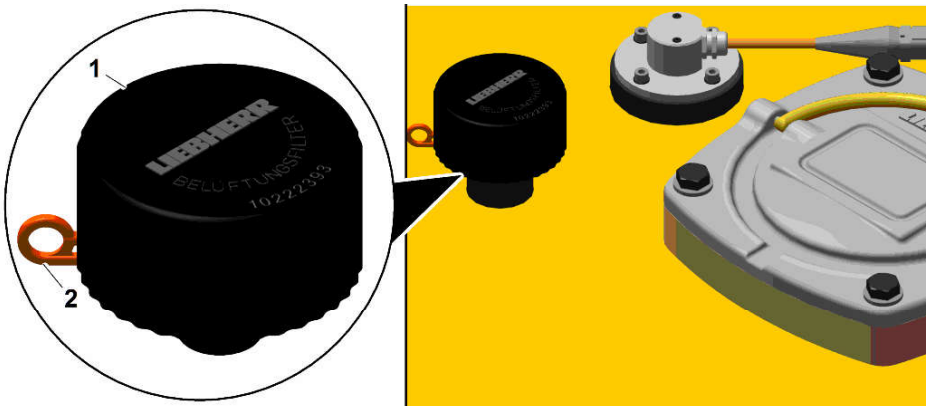

Fig. 848: Depressurising hydraulic tank

1 Breather filter **2** Securing pin

▶ Insert securing pin **2**.

▶ Unscrew breather filter **1** by hand by a maximum of one turn. Use open-end spanner if necessary.
▷ Hydraulic tank is depressurised.

When maintenance tasks on hydraulic system are complete:
▶ Screw in breather filter **1**.

▶ Pull out securing pin **2** (theft prevention).

5.10.2 Hydraulic tank: Checking oil level

Checking hydraulic oil level

The hydraulic oil level depends on the hydraulic oil temperature.

Make sure the following preconditions are met:
– Machine is parked on level ground.

DANGER
Bursting tyre!
Danger to life.

- ▶ Do not pump up depressurised tyres again.
- ▶ Use a sufficiently long tyre inflation hose with self-locking inflation valve.
- ▶ Stand sideways to the tyre and away from the danger zone.

The tyre pressure affects the working behaviour of the machine.

Manufacturer	Type	Size	Air pressure
Bridgestone	Fast Grip	10.00–20	101.53 psi
Mitas	EM22	10.00–20	108.78 psi
Nokian	Armor Gard	10.00–20	108.78 psi

Tab. 134: Tyre pressure table

- ▶ See table for specified value.
- ▶ Attach measuring instrument.
- ▶ Check tyre pressure.
- ▶ Correct tyre pressure if necessary.

5.12.3 Tyres: checking foam-filled tyres

Note
The running characteristics change when tyres are filled with foam. This can adversely affect the performance of the machine.

- ▶ Use only foam-filled tires supplied by Liebherr.

5.12.4 Wheels: Checking mounting of the wheel nuts

DANGER
Incorrectly tightened wheel nuts!
Danger to life.

- ▶ Make sure that all wheel nuts are tightened with specified tightening torque.
- ▶ Check tightening torque after 50, 100 and 250 operating hours.

Make sure the following preconditions are met:
- ❑ Machine is parked on level and firm ground.
- ❑ Machine is secured with chocks to prevent it from rolling away.
- ❑ A torque wrench with a sufficient setting range is available.

LHB/12222151/01/2018-12-13/en

5.16 Slewing gearbox and slewing ring

5.16.1 Slewing gearbox: Checking oil level

Checking oil level

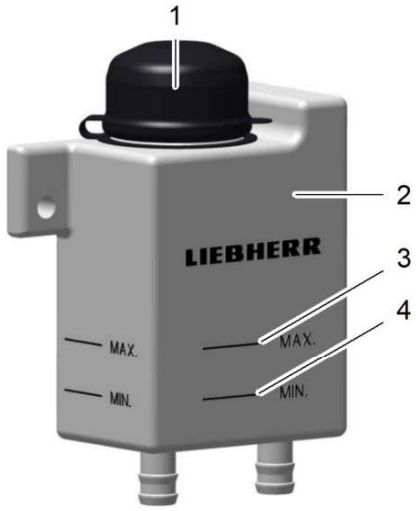

Fig. 869: Oil tank of slewing gearbox

1	Protective cap	**3**	MAX
2	Oil tank	**4**	MIN

▶ Check that oil level is between MIN **4** and MAX **3** marks.

If oil level is below MIN **4** mark:

▶ Check tightness.

▶ Fill with oil.

Checking tightness

▶ Check slewing gearbox, oil tank, connecting hoses, connections and covers for tightness.

▶ Repair or replace leaking components. For procedure see service manual under chapter 180.

If service manual cannot be accessed:

▶ Have repairs performed by Liebherr customer service.

Filling with oil

NOTICE
Incorrectly mixed gear oils!
Damage to transmission.

▶ Do not mix gear oils.

LHB/12222151/01/2018-12-13/en